

IEM's AI Modeling: Short-term COVID-19 Projections

Date: 7/1/21

Leveraging over 15 years of support to HHS for medical consequence modeling and our proprietary artificial intelligence (AI) models, IEM believes that our Coronavirus model outputs can be used to assist localities and their medical facilities to better prepare for an increase in hospitalizations, to better plan for and locate drive-through testing facilities, and to determine where increased levels of transmission may be occurring.

We have been refining our AI model over the past month and are confident in its ability to provide accurate 7-day projections that can be used for operational and logistical planning.

AI-based Model Background

IEM is currently using an AI model to fit data from various sources and project new cases of COVID-19. We do not assume the average number of secondary infections (R-value) stays the same over time. IEM's AI model finds the best R-value over time to evaluate how it changes over the course of the outbreak. The IEM modeling team is running ~11 million simulations to fit each state's data and using the best fit for the R-value to project new cases over the next 7 days. The AI models are executed on a daily basis to evaluate the changing dynamics of the COVID-19 pandemic. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 7/1/21 9 a.m.

Please provide any feedback or send any questions that you might have to us. We are continually updating and improving the model, so your feedback is critical.

Also, if you have more current or refined data for your State, Commonwealth or Territory that you would like IEM to factor in, please let us know.

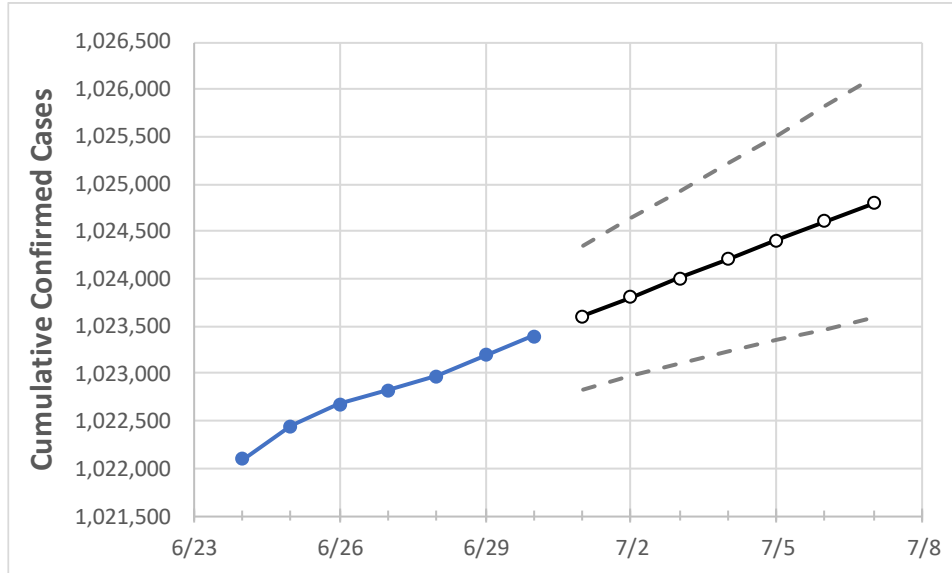
IEM's Modeling Lead

Dr. Prasith "Sid" Baccam is a **Computational Epidemiologist expert** at IEM with more than **20 years of experience in medical consequence modeling and simulation of disease outbreaks** and medical consequences following hypothetical attacks with biological agents or emerging infectious diseases. He develops key simulation models and decision support tools at IEM, specializing in public health, disaster response, and medical countermeasures (MCM) to enhance data-driven decision making and improve modeling assumptions.

Upon receiving his **Ph.D. in Applied Mathematics and Immunobiology** at Iowa State University, Dr. Baccam worked as a Postdoctoral Research Associate at Los Alamos National Laboratory where he focused on researching viral and immunological modeling. After his stint at Los Alamos, Dr. Baccam has served as Task Lead in multiple public health projects have allowed him to develop expertise as a mathematical biologist and a leader on high-performance modeling and simulation teams.

He has worked with state and local public health officials as well as Federal agencies, including **HHS**, the Centers for Disease Control and Prevention (**CDC**), and the Department of Homeland Security (**DHS**). Dr. Baccam has published numerous papers on public health response models and implications on policy and has been invited to participate in workshops and symposiums held by the Institute of Medicine (now the National Academy of Health). His modeling results have been briefed to the **Executive Office of the President** and informed two presidential policy actions.

New Jersey State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7

New Jersey 1,022,830 1,022,977 1,023,200 1,023,395 1,023,602 1,023,810 1,024,007 1,024,207 1,024,406 1,024,607 1,024,803

Note: The State's projection shows a "best estimate" curve (the solid line with circles) and the dotted lines are the upper and lower estimates around that best estimate. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

New Jersey Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7
Bergen	104,908	104,921	104,955	104,996	105,023	105,050	105,077	105,106	105,134	105,162	105,189
Burlington	44,375	44,389	44,392	44,399	44,405	44,412	44,418	44,424	44,430	44,436	44,442
Camden	55,901	55,911	55,925	55,951	55,963	55,975	55,987	55,999	56,011	56,023	56,035
Essex	94,482	94,494	94,505	94,502	94,513	94,524	94,535	94,544	94,554	94,565	94,574
Gloucester	30,695	30,696	30,718	30,725	30,732	30,739	30,747	30,754	30,762	30,769	30,777
Hudson	88,370	88,372	88,379	88,385	88,392	88,397	88,403	88,408	88,413	88,419	88,423
Hunterdon	9,883	9,884	9,888	9,894	9,899	9,903	9,908	9,912	9,917	9,922	9,927
Mercer	34,183	34,186	34,193	34,203	34,209	34,214	34,220	34,225	34,230	34,235	34,241
Middlesex	92,689	92,701	92,703	92,684	92,698	92,711	92,724	92,737	92,750	92,762	92,774
Monmouth	76,019	76,038	76,066	76,104	76,140	76,177	76,215	76,253	76,292	76,332	76,374
Morris	50,363	50,375	50,386	50,394	50,403	50,412	50,421	50,430	50,439	50,448	50,456
Ocean	76,397	76,417	76,443	76,472	76,496	76,521	76,545	76,569	76,594	76,619	76,644
Passaic	73,380	73,384	73,397	73,407	73,419	73,431	73,442	73,453	73,463	73,474	73,485
Somerset	30,221	30,233	30,240	30,241	30,249	30,257	30,266	30,274	30,282	30,291	30,299
Sussex	14,108	14,112	14,116	14,118	14,122	14,127	14,131	14,135	14,140	14,144	14,148
Union	71,738	71,741	71,760	71,768	71,776	71,784	71,791	71,799	71,806	71,813	71,820
Warren	10,024	10,031	10,034	10,037	10,040	10,042	10,045	10,048	10,051	10,053	10,056

Some recipients of our daily COVID-19 short-term (7 day) projections have requested projections of demand for: hospital bed, intensive care unit (ICU) beds, and mechanical ventilation. We realize that different states and localities will have different characteristics for hospital demand of COVID-19 cases, and we are presenting the best assumptions we could find for those medical demands based on scientific literature and health data reporting. Specifically:

- **Beds:** For hospitalization, we use a range of 10% and 20% of cases require hospitalization based on CDC's report ([MMWR, March 18, 2020](#)) and state reports of COVID-19 cases.
- **ICU:** The CDC report found that 24% of hospitalized cases require ICU care.
- **Ventilators:** Based on clinical data from China and state reports, we assume that 50% of ICU cases require a ventilator.

If you have other estimates for these assumptions, please share them with us as we work to refine our modeling, assumptions, and data on a daily basis.

The medical demands shown in the table assume 20% of **cumulative** confirmed cases require hospitalization. To get the medical demand for the assumption that 10% of confirmed cases require hospitalization, simply divide the demand by 2.

New Jersey Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	6/27	6/28	6/29	6/30	7/2			7/4			7/6					
Bergen	104,908	104,921	104,955	104,996	105,050	(21,010)	[5,042]	{2,521}	105,106	(21,021)	[5,045]	{2,523}	105,162	(21,032)	[5,048]	{2,524}
Burlington	44,375	44,389	44,392	44,399	44,412	(8,882)	[2,132]	{1,066}	44,424	(8,885)	[2,132]	{1,066}	44,436	(8,887)	[2,133]	{1,066}
Camden	55,901	55,911	55,925	55,951	55,975	(11,195)	[2,687]	{1,343}	55,999	(11,200)	[2,688]	{1,344}	56,023	(11,205)	[2,689]	{1,345}
Essex	94,482	94,494	94,505	94,502	94,524	(18,905)	[4,537]	{2,269}	94,544	(18,909)	[4,538]	{2,269}	94,565	(18,913)	[4,539]	{2,270}
Gloucester	30,695	30,696	30,718	30,725	30,739	(6,148)	[1,475]	{738}	30,754	(6,151)	[1,476]	{738}	30,769	(6,154)	[1,477]	{738}
Hudson	88,370	88,372	88,379	88,385	88,397	(17,679)	[4,243]	{2,122}	88,408	(17,682)	[4,244]	{2,122}	88,419	(17,684)	[4,244]	{2,122}
Hunterdon	9,883	9,884	9,888	9,894	9,903	(1,981)	[475]	{238}	9,912	(1,982)	[476]	{238}	9,922	(1,984)	[476]	{238}
Mercer	34,183	34,186	34,193	34,203	34,214	(6,843)	[1,642]	{821}	34,225	(6,845)	[1,643]	{821}	34,235	(6,847)	[1,643]	{822}
Middlesex	92,689	92,701	92,703	92,684	92,711	(18,542)	[4,450]	{2,225}	92,737	(18,547)	[4,451]	{2,226}	92,762	(18,552)	[4,453]	{2,226}
Monmouth	76,019	76,038	76,066	76,104	76,177	(15,235)	[3,657]	{1,828}	76,253	(15,251)	[3,660]	{1,830}	76,332	(15,266)	[3,664]	{1,832}
Morris	50,363	50,375	50,386	50,394	50,412	(10,082)	[2,420]	{1,210}	50,430	(10,086)	[2,421]	{1,210}	50,448	(10,090)	[2,421]	{1,211}
Ocean	76,397	76,417	76,443	76,472	76,521	(15,304)	[3,673]	{1,837}	76,569	(15,314)	[3,675]	{1,838}	76,619	(15,324)	[3,678]	{1,839}
Passaic	73,380	73,384	73,397	73,407	73,431	(14,686)	[3,525]	{1,762}	73,453	(14,691)	[3,526]	{1,763}	73,474	(14,695)	[3,527]	{1,763}
Somerset	30,221	30,233	30,240	30,241	30,257	(6,051)	[1,452]	{726}	30,274	(6,055)	[1,453]	{727}	30,291	(6,058)	[1,454]	{727}
Sussex	14,108	14,112	14,116	14,118	14,127	(2,825)	[678]	{339}	14,135	(2,827)	[678]	{339}	14,144	(2,829)	[679]	{339}
Union	71,738	71,741	71,760	71,768	71,784	(14,357)	[3,446]	{1,723}	71,799	(14,360)	[3,446]	{1,723}	71,813	(14,363)	[3,447]	{1,724}
Warren	10,024	10,031	10,034	10,037	10,042	(2,008)	[482]	{241}	10,048	(2,010)	[482]	{241}	10,053	(2,011)	[483]	{241}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.